Amendments to the Specification:

On page 1, after the title, insert the following:

CROSS-REFERENCE TO RELATED APPLICATION

This application is the U.S. national phase of PCT Appln. No. PCT/EP2005/003388 filed March 31, 2005, which claims priority to German application 10 2004 018 284.1 filed April 15, 2004.

BACKGROUND OF THE INVENTION

1. Field of the Invention

Please amend the paragraph on page 1, line 4, as shown below:

The invention relates to a process for ethylene recovery in a ~~cycle~~ recirculating gas process for preparing vinyl acetate, in which a substream of the ethylenic product stream is discharged and sent to a process for recovering or converting ethylene.

On page 1, before the paragraph beginning on line 9, please add the following:

2. Description of the Related Art

Please amend the paragraph on page 1, line 24, as shown below:

A problem in this reaction is that inert substances are introduced via the ethylene and oxygen reactants, and are difficult to remove, but increasingly reduce the selectivity of the re-action when they are recycled into the reactor and accumulate in the ~~cycle~~ circulating gas. The inerts nitrogen and argon are introduced via the oxygen, and ethane and to a slight extent methane

via ethylene. These inerts have to be removed continuously from the system, otherwise their accumulation would inhibit the re-action. Since ethylene constitutes the majority of the ~~cycle~~ recycle gas mixture at from 60 to 70% by volume, the removal of inerts is generally accompanied by a distinct loss of ethylene of from about 1 to 4% by volume of the amount fed. In addition, side reactions form carbon dioxide and further by-products such as methyl acetate and ethyl acetate.

Please amend the paragraph on page 2, line 1, as shown below:

Owing to the incomplete conversion of the reactants, the gaseous product stream is worked up in a continuous process: in a ~~cycle~~ recycle gas scrubber operated with acetic acid, the vinyl acetate target product is washed out of the ~~cycle~~ recycle gas and worked up in subsequent distillation processes. The vinyl acetate-free ~~cycle~~ recycle gas is sent through a ~~cycle~~ gas compressor to the acetic acid saturator and subsequently to the reactor. In order to reduce the CO_2 by-product, a portion of the vinyl acetate-free ~~cycle~~ recycle gas is discharged on the pressure side of the ~~cycle~~ recycle gas compressor and sent to a water scrubber. Subsequently, a small fraction is sent to incineration for inerts discharge, and the remainder is passed into a CO_2 absorption column and then sent back to ~~the cycle~~ gas recirculation in CO_2 free form.

Please amend the paragraph on page 2, line 15 as shown below:

The inerts ~~discharge~~ discharged by means of removal of ethylene from the ~~cycle~~ recycle gas prevents accumulation of ethane, methane, argon and nitrogen in the ~~cycle~~ recycle gas stream. The amount of the inert stream discharged is controlled depending on the ethylene concentration in the ~~cycle~~ recycle gas. When the amounts discharged are too small, the inerts become concentrated in the ~~cycle~~ recycle gas and the ethylene concentration in the ~~cycle~~ recycle gas falls. However, the ethylene selectivity increases with the ethylene content of the ~~cycle~~ recycle gas. The higher the ethylene content in the ~~cycle~~ recycle gas, i.e. the more ethylene comprising inerts from the ~~cycle~~ recycle gas is removed and "fresh" ethylene is supplied, the better the ethylene selectivity is. However, from a certain proportion, a more extensive discharge of ethylene comprising inerts is uneconomic, since each additional ton of

vinyl acetate monomer has to be paid for with a disproportionately high fraction of discharged ethylene comprising inerts. Since ethylene is expensive, the recovery of ethylene has the highest priority as a cost-lowering measure.

Please amend the paragraph on page 3, line 14, as shown below:

In a further variant, to which WO-A 01/00559 is directed, the majority of the gaseous product stream is contacted at system pressure with acetic acid in an absorption vessel. At the top of the column, methane, nitrogen, oxygen and argon are re-moved, and a mixture of vinyl acetate, acetic acid and ethyl-ene is drawn off at the bottom of the column. This mixture is contacted in a gas scrubber with the remaining fraction of the gaseous product stream. The ethylene is drawn off at the top and recycled into the reactor; the vinyl acetate is obtained at the bottom of the column and sent to further workup. The decompression/compression step becomes unnecessary, but here too the inert gases accumulate increasingly in the ~~cycle~~ recycle gas.

Please amend the paragraph on page 3, line 28, as shown below:

A similar process is the subject matter of US-A 3,714,237, in which the gaseous stream is likewise worked up by scrubbing with acetic acid, vinyl acetate is removed, and the residual gas is recycled into the reactor after the carbon dioxide has been washed out. Here too, the inert gases accumulate increasingly in the ~~cycle~~ recycle gas.

On page 3, before line 35, please insert the following heading:

SUMMARY OF THE INVENTION

Please amend the paragraph on page 3, line 35 as shown below:

It is therefore an object of the present invention to configure the ~~cycle~~ recycle gas process in the preparation of vinyl acetate in such a way that the accumulation of the inert gases

mentioned is very substantially prevented. These and other objects are achieved by a process in which the product gas stream is fed at system pressure to a scrubber and scrubbed with acetic acid, vinyl acetate is removed, the vinyl acetate-free gas is freed of CO_2, a portion of the ethylene-containing gas is recycled, and the remainder of the ethylene-containing stream is used in other processes.

On page 4, before line 1, please insert the following headings and paragraph:

BRIEF DESCRIPTION OF THE DRAWINGS

The single drawing figure illustrates a block diagram of one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please amend the paragraph on page 4, line 2 as shown below:

The invention thus provides a process for ethylene recovery in a ~~cycle~~ recycle gas process for preparing vinyl acetate by means of

a) heterogeneously catalysed reaction of ethylene, acetic acid and oxygen at a pressure of from 1 to 50 bar and a temperature of from 50°C to 200°C,

b) separation of the product gas stream comprising substantially ethylene, vinyl acetate, acetic acid, water, carbon dIoxide and further inert gases, and

c) recycling of ethylene into the ~~cycle~~ recycle gas process,

characterized in that

d) the product gas stream is fed at system pressure to a ~~cycle~~ recycle gas scrubber charged with acetic acid, and vinyl acetate is removed from the ~~cycle~~ recycle gas, and

e) the vinyl acetate-free ~~cycle~~ recycle gas is subsequently fed to a CO_2 absorption to remove carbon dioxide, and then

f) a portion of the ethylenic ~~cycle~~ recycle gas stream is recycled into the reaction system, and the remainder of the ethylenic gas stream is discharged and reused in processes for recovering or converting ethylene.

Please amend the paragraph on page 4, at line 35, as shown below:

The product gas stream is subsequently separated in a ~~cycle~~ recycle gas scrubber operated with acetic acid, in which vinyl acetate, acetic acid, water and further condensable fractions are removed, and the vinyl acetate monomer is obtained by means of distillative workup. After the removal of the condensable fractions (vinyl acetate, acetic acid, water), the ~~cycle~~ recycle gas typically has the following composition:

from 60 to 65% by volume of ethylene,

from 12 to 18% by volume of CO_2,

from 5 to 8% by volume of ethane,

from 4 to 9% by volume of oxygen,

from 4 to 6% by volume of nitrogen,

from 1 to 2% by volume of argon,

from 0.5 to 1% by volume of methane.

Please amend the paragraph on page 5, at line 16, as shown below:

In the inventive procedure, the ~~cycle~~ recycle gas is now conducted into a CO_2 absorption/desorption, customarily operated with aqueous potassium carbonate solution. After the CO_2 scrubbing, the ~~cycle~~ recycle gas generally has the following composition:

from 80 to 83 % by volume of ethylene,
from 1 to 4 % by volume of CO_2,
from 2 to 4 % by volume of ethane,
from 3 to 5 % by volume of oxygen,
from 3 to 4 % by volume of nitrogen,
from 0.5 to 1 % by volume of argon,
from 0.2 to 0.4% by volume of methane.

After the CO_2 scrubbing, the product stream is divided. A majority of the ethylenic ~~cycle~~ recyle gas stream is recycled into the reactor via a ~~cycle~~ recycle gas compressor and acetic acid saturator. The remainder of the ethylenic gas stream is discharged and reused in processes for converting ethylene. Preference is given to discharging from 1 to 25% by volume, more preferably from 5 to 20% by volume, of the ethylenic gas stream. The carbon dioxide laden with traces of hydrocarbons is passed to thermal disposal.

Please amend the paragraph on page 6, line 27, as shown below:

Example 1:

A 25 m^3 tubular reactor 1 which was equipped with a Pd/Au sup-ported catalyst was charged at a pressure of 8.5 bar and a temperature of 160°C via line 2 with a gas mixture having a gas hourly space velocity (GHSV) of 3500 h^{-1}. The gas mixture (~~cycle~~ recycle gas) had the following composition:

61.7% by volume of ethylene,
10.8% by volume of CO_2,
12.7% by volume of acetic acid,

3.4% by volume of ethane,
8.0% by volume of oxygen,
0.8% by volume of nitrogen,
0.8% by volume of argon,
1.0% by volume of methane
0.8% by volume of water.

Please amend the paragraph on page 7, line 5 as shown below:

The ~~cycle~~ recycle gas leaving the reactor 1 was fed via line 3 to a vinyl acetate scrubber 4 operated with acetic acid, and subsequently via line 6 to a carbon dioxide scrubber 7 operated with potash. A vinyl acetate/acetic acid/water mixture was withdrawn via line 5 from the vinyl acetate scrubber 4 and sent to further processing. After the carbon dioxide scrubbing, 200 kg/h, corresponding to approx. 7% by volume, of the ~~cycle~~ recycle gas going to the CO_2 removal were passed via line 8 into the acetic acid preparation for ethylene recovery, and the remainder was recycled via line 9 and the ~~cycle~~ recycle gas compressor 10 into the reactor 1. The CO_2 discharge for thermal disposal was effected via path 11.

Please amend the paragraph on page 7, line 20 as shown below:

Example 2:
The procedure was analogous to Example 1, with the difference that, after the CO_2 scrubbing, 300 kg/h, i.e. approx. 10% by volume, of the ~~cycle~~ recycle gas going to the CO_2 removal, ~~have been~~ is discharged. This increased the ethylene content in the ~~cycle~~ recycle gas to 64% by volume; the other components were adjusted correspondingly. The reaction conditions (GHSV, ~~cycle~~ recycle gas pressure, etc.) remained the same.

Please amend the paragraph on page 7, line 33 as shown below:

Example 3:

The procedure was analogous to Example 1, with the difference that, after the CO_2 scrubbing, 450 kg/h, i.e. approx. 15% by volume, of the ~~cycle~~ recycle gas going to the CO_2 removal ~~have been~~ is passed into the acetic acid preparation for ethylene recovery. This resulted in an increase in the ethylene content in the ~~cycle~~ recycle gas to 66% by volume; the other components were adjusted correspondingly. The reaction conditions (GHSV, ~~cycle~~ recycle gas pressure, etc.) remained the same.